IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
KONDO et al.	)	Group Art Unit: 1794
	)	
Application No.: 10/550,005	)	Examiner: Victor S. Chang
	)	
Filed: September 23, 2005	)	
	)	Conformation No.: 5730
For: MICROPOROUS POLYETHYLENE FILM	)	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

DECLARATION UNDER 37 C.F.R. §1.132 of Masahiro OHASHI

I, Masahiro OHASHI, do hereby make the following declaration:

1. I am an inventor of the subject matter described in U.S. Application No. 10/550,005 ("the '005 application"), filed September 23, 2005.

2. I have been employed by Asahi Kasei Chemicals Corporation and its predecessor corporations since April 1, 1997, and I am presently an Assistant Manager. During my employment at Asahi Kasei Chemicals Corporation, I have about seven years of experience in the research and development of microporous polyethylene films.

3. My qualifications and professional training are as follows: I have a Master of engineer degree from the Kyoto University in chemistry issued 1997.

4. My general work experience includes preparation of microporous polyethylene films, experiments using microporous polyethylene films, development of Examples 1-9 and Comparative Examples 1-6 as they relate to Table 1.

5. I participated in the development of experiments described in Examples 1-9 and Comparative Examples 1-6. For

purposes of this Declaration, the following experiments were performed under my supervision.

6. I have read and understand the entire disclosure of the '005 application, including claims 1-24.

7. I have read and understand the rejections presented in the Final Office Action mailed July 19, 2007 and in the Advisory Action mailed November 30, 2007, as well as the references cited.

8. Specifically, I have been asked to provide my opinion on whether the α-olefin content of the blend as claimed in the '005 application was known at the time of the '005 filing date, September 23, 2005. Further, I have been asked to give my opinion as to whether the properties of the claimed blend could be predicted from the α-olefin content as claimed.

9. The present invention provides improved film rupture temperature and also a good balance among film thickness, porosity, air permeability, puncture strength, and fusing temperature by using a combination of a particular HDPE copolymer and a particular HDPE.

10. Based on my experience, it is my opinion that a polymer blend of the particular HDPE copolymer and the particular HDPE, which blend specifically has the claimed α-olefin content, was not known in the art and neither U.S. Patent No. 6,245,272 ("Takita") or the Concise Encyclopedia of Polymer Science and Engineering ("Encyclopedia") disclose the specifically claimed polymer blend.

11. To the best of my knowledge, the relationship between the α-olefin content of the blend of the HDPE copolymer and the HDPE and the effect of improved film rupture temperature and a good balance among film thickness, porosity, air permeability, puncture strength, and fusing temperature was not known in the art as of the '005 filing date. The above effect of the present invention cannot be exhibited by using either the HDPE copolymer alone or the HDPE alone, but only by using both the HDPE copolymer and the

HDPE. This is clear from Comparative Example 2, wherein the HDPE was not used but the HDPE copolymer alone was used, and the α-olefin content was adjusted to 0.6% by mole. In Comparative Example 2, the obtained microporous film was inferior in a balance among physical properties, particularly in puncture strength and film rupture temperature, as compared to Examples 3, 6 and 7.

12. From the following experiments, it is clear that the effect of the present invention was exhibited over the entire range of 0.01 to 0.1% by mole of α-olefin content of the whole blend. As discussed below, experiments compare overall microporous film properties as a function of α-olefin content.

13. For the initial experiments, as shown by Table I, the microporous membranes were prepared in the same manner as in Example 1 of the '005 application, except that the composition of starting materials was changed to achieve comonomer contents ranging from 0.00 to 1.20.

Table I

Experiment No.	1	2	3	4	5	6
Ultrahigh molecular weight PE (2000000)	30	30	30	30	25	25
High density PE (300000)	70	60	45	40	0	0
Copolymerized linear high density PE-A	0	10	25	0	0	0
Copolymerized linear high density PE-B	0	0	0	30	75	0
Copolymerized linear high density PE-C	0	0	0	0	0	75
Comonomer content of the microporous membrane (mol %)	0.00	0.03	0.15	0.30	0.75	1.20

PE: polyethylene
PE-A: Comonomer content of copolymerized linear high density is 0.6 mol%.
PE-B: Comonomer content of copolymerized linear high density is 1.0 mol%.
PE-C: Comonomer content of copolymerized linear high density is 1.6 mol%.
** Comonomer: α-olefin unit with 3 or more carbon atoms

14. The overall properties of the microporous membranes

from Table I were then tested using the procedures describe for Examples 1-9 and Comparative Examples 1-6 in the '005 application.

15. As shown by Table II, when the microporous membrane has a comonomer content of 0 mol%, which is outside of the claimed comonomer range, the fusing temperature was determined to be 141°C. This temperature results in insufficient fusing to stop a runaway reaction in the inside of the batteries as described on page 2, lines 1-5 in the '005 application. In addition, when the comonomer content of the membrane was 1.20 mol%, which is outside of the claimed comonomer range, the air permeability was 870 seconds and the film rupture temperature was 145°C, indicating insufficient permeability and heat resistance. As described on pages 19-20 of the '005 application, air permeability is preferably 100-600 seconds and the heat resistance is preferably 150°C or higher as the film may rupture at the time of battery test in an oven at 150°C.

Table II

	1	2	3	4	5	6
Comonomer content of the microporous membrane (mol%)	0.00	0.06	0.15	0.30	0.75	1.20
Film thickness (um)	18	18	18	18	17	17
Porosity (%)	47	47	46	43	35	30
Air permeability	220	230	260	360	520	870
Puncture strength (g)	5.1	5.0	5.0	4.8	4.2	4.0
Fusing temperature (°C)	141	140	138	136	130	126
Film rupture temperature (°C)	156	155	155	154	151	145

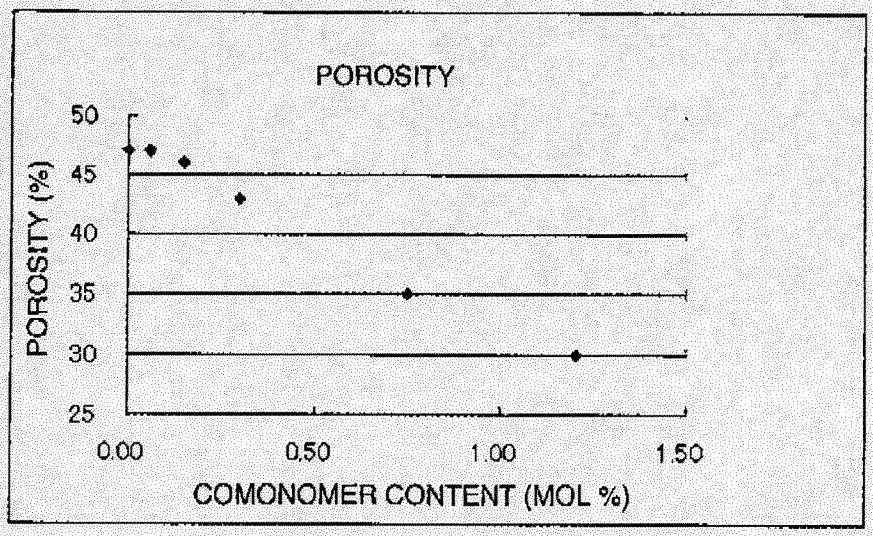
16. As shown by Table II, when the comonomer content was within the claim scope, i.e., 0.01 to 1% by mole, the

fusing temperature was no more than 140°C and the film rupture temperature was not less than 150°C.

Therefore, when the HDPE and the HDPE copolymer are used together and the α-olefin content of the whole blend is adjusted according to the present invention, these factors behave synergistically to realize a microporous film excellent in fusing temperature and film rupture temperature, and also in a balance among the other physical properties. Beneficial effects have been identified within the claimed range that were unexpected as of the '005 filing date.

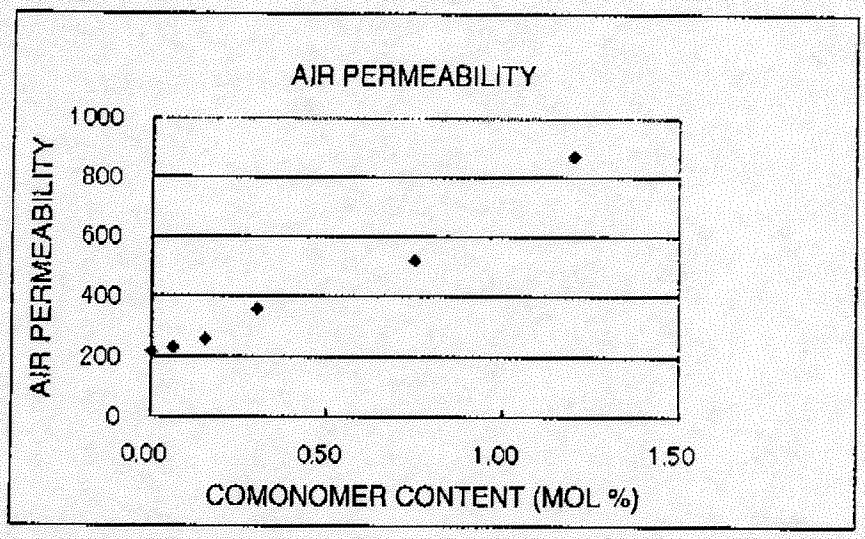
17. The data listed in Table II is also represented by Graphs A-E, which illustrate the change in a given property as a function of comonomer content.

Graph A



18. As shown by Graph A above, the porosity decreases as the comonomer content is increased. These results show that when a microporous membrane has a comonomer content of 1.20 mol%, which is outside the claimed comonomer range, the porosity reaches an insufficient limit. As described on page 19 in the '005 application, the porosity of a microporous film is preferably 30 to 70% and more preferably 35 to 50%.

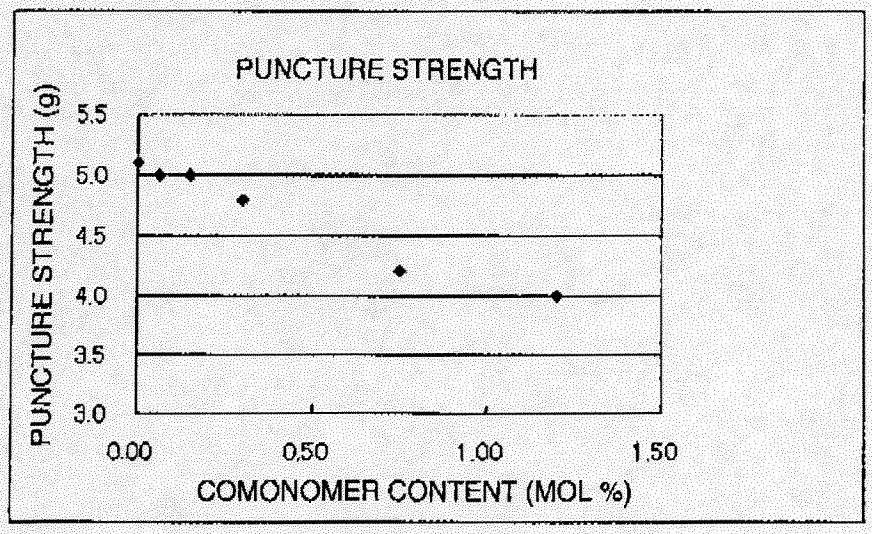
Graph B



19. As shown by Graph B above, air permeability increases as the comonomer content is increased. These results show that when a microporous membrane has a comonomer content of 1.20 mol%, which is outside the claimed comonomer range, the air permeability is insufficient. As described on page 19 in the '005 application the preferable range for air permeability is 100 to 600 seconds.

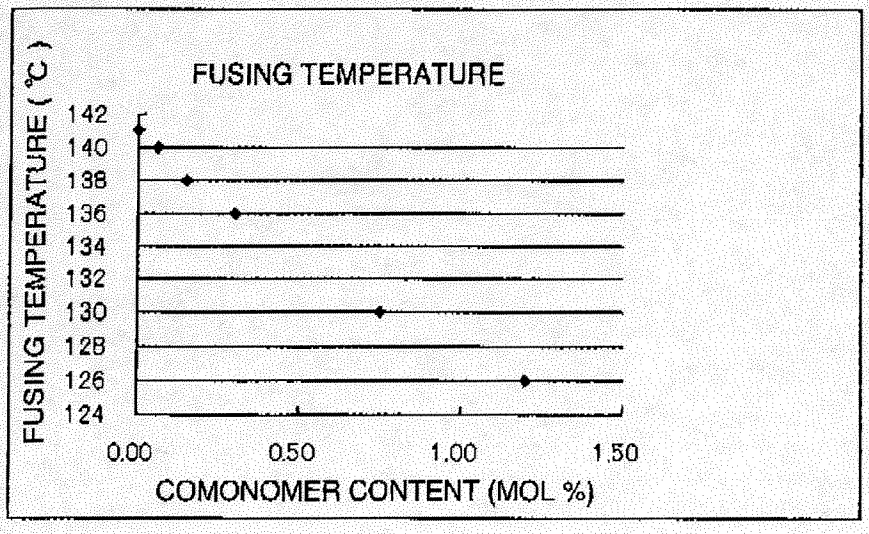
20. As shown by Graph C below, the puncture strength decreases with increasing comonomer content. These results show that a microporous membrane having the specifically claimed polymer blend maintains a preferable puncture strength from the viewpoint of rupture resistance during the battery winding or failure of battery performance due to the short circuit between electrodes.

Graph C



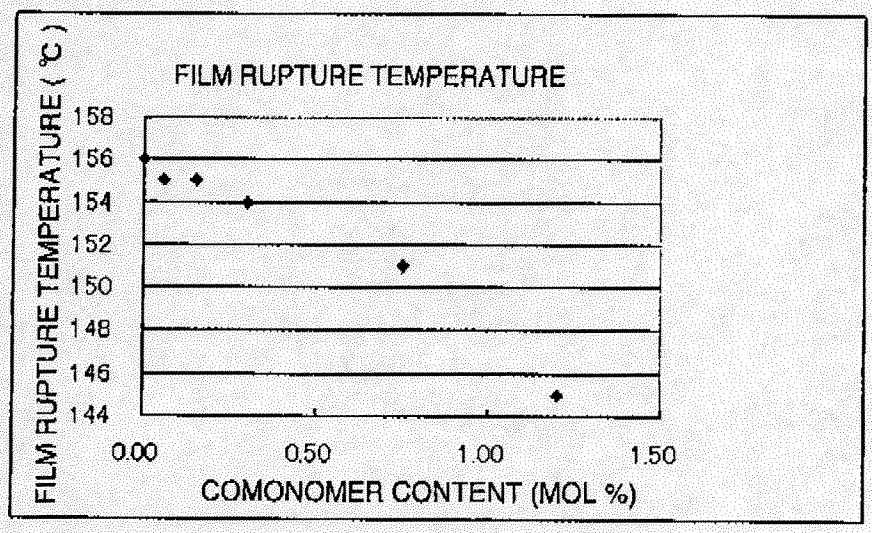
21. As shown by Graph D below, the fusing temperature decreases within the claimed comonomer range, thereby providing microporous films with advantageous fusing temperatures at or below 140°C.

Graph D



22. As shown by Graph E below, the film rupture temperature is consistently high throughout the claimed comonomer range. However, at α-olefin contents greater than 1 mol%, the film rupture temperature falls substantially below the preferred threshold of 150°C. Thus, separators or microporous films outside of the claimed α-olefin content, specifically greater than 1 mol%, will not exhibit sufficient heat resistance.

Graph E



23. The above experiments show that when the comonomer content is outside of the claimed range, insufficient microporous film properties result. For example, as shown by Table II and Graph A, a film with a comonomer content of 1.20 mol% has a porosity of 30%, which is not above the preferable threshold of 35%. Also, as shown by Table II and Graph B, a film with a comonomer content of 1.20 mol% has an air permeability of 870 seconds, which is above the upper threshold limit of 600 seconds. Moreover, as shown by Table II and Graph D, a film with a comonomer content of 0.00 mol% is above the upper fusing temperature limit of 140°C. Finally, as shown by Table 11 and Graph E, a film with a

comonomer content of 1.20 mol% has a film rupture temperature of 145°C, which is well below the preferred lower threshold of 150°C. In summary, tested microporous film properties are not sufficient when a microporous film contains a comonomer content that is not within the claimed range.

24. As shown by the above data, a microporous polyethylene film as claimed, having an HDPE copolymer with an α-olefin content of 0.1 to 1% by mole and an HDPE with a particular Mv, results in improved rupture temperature and an overall good balance between film thickness, porosity, air permeability, puncture strength, and fusing temperature. The improvement of the overall properties of microporous films as a function of the specifically claimed α-olefin content, and the concomitant use of the HDPE and the HDPE copolymer in the '005 application are unexpected, because no synergistic effect of the HDPE and the HDPE copolymer was known in the prior art.

25. I further declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true, and understand that willful false statements and the like are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code, and may jeopardize the validity of the application or any patent issuing thereon.

Dated: 16th day of April, 2008 By: Masahiro Ohashi

Masahiro OHASHI